



United States Environmental Protection Agency

<https://www.epa.gov/tribal-air/tribal-minor-new-source-review>

January 4, 2017

Part 2: Submit Within 60 Days After Startup of Production -- Emission and Production Information

FEDERAL IMPLEMENTATION PLAN FOR TRUE MINOR SOURCES IN INDIAN COUNTRY IN THE OIL AND NATURAL GAS PRODUCTION AND NATURAL GAS PROCESSING SEGMENTS OF THE OIL AND NATURAL GAS SECTOR Registration for New True Minor Oil and Natural Gas Sources and Minor Modifications at Existing True Minor Oil and Natural Gas Sources

Please submit information to:

[Reviewing Authority] USEPA Region 8
Address 1595 Wynkoop Street, Denver, CO 80202
Phone] 303-312-6312

A. GENERAL SOURCE INFORMATION (See Instructions Below)

1. Company Name Berry Petroleum Company, LLC		2. Source Name LC Tribal 3-36D-56	
3. Type of Oil and Natural Gas Operation Oil Production		4. New Minor Source? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
		5. True Source Modification? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
6. NAICS Code 211111		7. SIC Code 1311	
8. U.S. Well ID(s) or API Number(s) [if applicable] 43-013-52987; 43-013-52986; 43-013-52984			
9. Area of Indian Country Uinta and Ouray Reservation	10. County Duchesne	11a. Latitude 40.00645	11b. Longitude -110.5113

B. CONTACT INFORMATION (See Instructions Below)

1. Owner Name Berry Petroleum Company, LLC	Title
Mailing Address 5201 Truxton Ave. Bakersfield, CA 93309	
Email Address jarmstrong@bry.com	
Telephone Number 661.616.3941	Facsimile Number
2. Operator Name (if different from owner) Same as above	Title
Mailing Address	
Email Address	
Telephone Number	Facsimile Number
3. Source Contact Jon Armstrong	Title EHS Representative
Mailing Address	
Email Address jarmstrong@bry.com	
Telephone Number 661.616.3941	Facsimile Number

4. Compliance Contact Same as above		Title	
Mailing Address			
Email Address			
Telephone Number		Facsimile Number	

C. EMISSIONS AND OTHER SOURCE INFORMATION

Include all of the following information in the table below and as attachments to this form:

Note: The emission estimates can be based upon actual test data or, in the absence of such data, upon procedures acceptable to the Reviewing Authority. The following procedures are generally acceptable for estimating emissions from air pollution sources: (1) unit-specific emission tests; (2) mass balance calculations; (3) published, verifiable emission factors that are applicable to the unit (i.e., manufacturer specifications); (4) other engineering calculations; or (5) other procedures to estimate emissions specifically approved by the Reviewing Authority. Guidance for estimating emissions can be found at <https://www.epa.gov/chief>.

- ☐ Narrative description of the operations.
- ☐ Identification and description of any air pollution control equipment and compliance monitoring devices or activities.
- ☐ Type and actual amount (annually) of each fuel that will be used.
- ☐ Type of raw materials used (e.g., water for hydraulic fracturing).
- ☐ Actual, annual production rates.
- ☐ Actual operating schedules.
- ☐ Any existing limitations on source operations affecting emissions or any work practice standards, where applicable, for all regulated New Source Review (NSR) pollutants at your source. Indicate all requirements referenced in the Federal Implementation Plan (FIP) for True Minor Sources in Indian Country in the Oil and Natural Gas Production and Natural Gas Processing Segments of the Oil and Natural Gas Sector that apply to emissions units and air pollution generating activities at the source or proposed. Include statements indicating each emissions unit that is an emissions unit potentially subject to the requirements referenced in the FIP, but does not meet the definition of an affected facility under the referenced requirement, and therefore, is not subject to those requirements.
- ☐ For each emissions unit comprising the new source or modification, estimates of the total allowable (potential to emit) annual emissions at startup of production from the air pollution source for the following air pollutants: particulate matter, PM₁₀, PM_{2.5}, sulfur oxides (), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H₂SO₄), hydrogen sulfide (H₂S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates. Allowable annual emissions are defined as: emissions rate of an emissions unit calculated using the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical

or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation, or the effect it would have on emissions, is legally and practically enforceable. You must determine the potential for emissions within 30 days from the startup of production.

- ☒ For each emissions unit comprising the new source or modification, estimates of the total actual annual emissions during the upcoming, consecutive 12 months from the air pollution source for the following air pollutants: particulate matter (PM, PM₁₀, PM_{2.5}), sulfur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, ammonia (NH₃), fluorides (gaseous and particulate), sulfuric acid mist (H₂SO₄), hydrogen sulfide (H₂S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates. Estimates of actual emissions must take into account equipment, operating conditions, and air pollution control measures. You should calculate an estimate of the actual annual emissions using estimated operating hours, production rates, in-place control equipment, and types of materials processed, stored, or combusted.

D. TABLE OF ESTIMATED EMISSIONS

Provide in the table below estimates of the total allowable annual emissions in tons per year (tpy) and total actual annual emissions (tpy) for the following pollutants for all emissions units comprising the new source or modification.

POLLUTANT	TOTAL ALLOWABLE ANNUAL EMISSIONS (TPY)	TOTAL ACTUAL ANNUAL EMISSIONS (TPY)
PM	0.11	0.11
PM ₁₀	0.11	0.11
PM _{2.5}	0.11	0.11
SO _x	0.08	0.08
NO _x	10.16	10.16
CO	23.66	23.66
VOC	18.47	18.47
Pb	n/a	n/a

POLLUTANT	TOTAL ALLOWABLE ANNUAL EMISSIONS (TPY)	TOTAL ACTUAL ANNUAL EMISSIONS (TPY)
NH3	n/a	n/a
Fluorides	n/a	n/a
H₂SO₄	n/a	n/a
H₂S	0.03	0.03
TRS	0.03	0.03

C. Attachments

Narrative description of the operations

The LC Tribal 3-36D-56 Oil Production Facility is a multi-well pad with three colocated wells, LC Tribal 3-36D-56, 4-36D-56, and 6-36D-56. Oil, water and natural gas are piped from the wells to a three phase bulk separator or test separator. Separated liquids are piped to storage tanks and associated gas from the separators is sent to a gathering pipeline. Oil and produced water from the tanks is hauled out via tanker truck. Natural gas engines power the surface pumping units (artificial lift).

Identification and description of any existing air pollution control equipment and compliance monitoring devices or activities

Air Pollution Control Equipment

Emissions from the oil storage tanks and produced water tanks are routed to an enclosed combustor with a minimum control efficiency of 95%.

Compliance Monitoring Devices or Activities

The combustor is a manufacturer certified model equipped with an autoigniter. Semi-annual FLIR camera inspections are conducted in compliance with NSPS OOOOa well site leak detection requirements. Monthly AVO and quarterly Method 22 inspections are conducted.

Type and actual amount (annually) of each fuel that will be used

Field gas (from the well) is used in all fuel burning emission units
Annual fuel use: 68 MMscf/yr

Actual, annual production rates

Oil: 267 bbl/d
Produced Water: 153 bbl/d
Gas: 154 MCFD

Actual operating schedules

The well site is capable of operating 8,760 hours/year

Regulatory Evaluation

40 CFR Part and Subpart	Potentially Affected Sources at the Facility	Affected Source Determination
40 CFR part 60, subpart JJJJ	Spark-ignition combustion engine (pumpjack engine)	Applicable - The pumpjack engines are stationary spark ignition combustion engine that commenced construction after 6/12/2006, was manufactured after 7/1/2008, and is less than 500 hp [§60.4230(a)(4)(iii)]
40 CFR part 60, subpart OOOOa	Oil Well Storage Vessels Pneumatic Controllers Collection of fugitive components	Oil Well: Applicable - Well was hydraulically fractured [§60.5365a(a)] Storage Vessels: Applicable -Oil Storage vessels have potential VOC emissions greater than 6 tpy [§60.5365a(e)] Pneumatic Controllers: Not Applicable - Pneumatic controllers do not have a continuous bleed rate greater than 6 scfh [§60.5365a(d)(1)] Fugitive Components: Applicable - Fugitive components are located at a well site [§60.5365a(i)]
40 CFR part 63, subpart DDDDD	Process Heaters	Not Applicable - the facility is not a major source of hazardous air pollutants [§63.7485]
40 CFR part 60, subpart Kb	Storage Vessels	Not Applicable - No storage vessel has a capacity greater than 75 m ³ [§60.110b(a)]
40 CFR part 60, subpart IIII	N/A - no potentially affected sources are present at the facility (e.g. no compression ignition combustion engines)	N/A
40 CFR part 63, subpart HH	Storage Vessels	Not Applicable - The facility is not a major source of hazardous air pollutants [§63.760(b)]
40 CFR part 63, subpart ZZZZ	Reciprocating internal combustion engine	Applicable - The pumpjack engines are reciprocating internal combustion engines [§63.6585]
40 CFR part 60, subpart KKKK	N/A - No potentially affected sources are present at the facility (e.g. no combustion turbines)	N/A

Emission Summary, tpy

Emission Source	NOX	CO	VOC	PM	PM10	PM2.5	SOX	H2S/TRS
Oil Storage Tanks			1.90					0.03
Produced Water Tank			0.0001					
Emergency Relief Tank								
Enclosed Combustor	0.59	3.22					0.05	
Tank Heaters	0.74	0.62	0.04	0.06	0.06	0.06	0.004	
Separator Burner	0.74	0.62	0.04	0.06	0.06	0.06	0.004	
Pump Jack Engine	8.10	19.21	4.09	0.0026	0.0026	0.0026	0.020	
Truck Loading			9.57					
Pneumatic controlers			2.46					
Fugitives			0.37					
Total	10.16	23.66	18.47	0.11	0.11	0.11	0.08	0.03

Company: Berry Petroleum Company, LLC
 Subject: Lake Canyon Tribal 3-36D-56
 Source: (4) 400-barrel Crude Oil Tanks

Throughput (bbl/d):	267
Throughput (bbl/yr):	97,455
Hours/year:	8,760

Emission Basis:

Four (4) 400 barrel (each) atmospheric tanks are used to temporarily store crude oil produced at the facility. They receive pressurized crude oil from the site separator. Flashing, working and breathing losses from the oil are estimated using ProMax under typical site operating temperature and pressure.

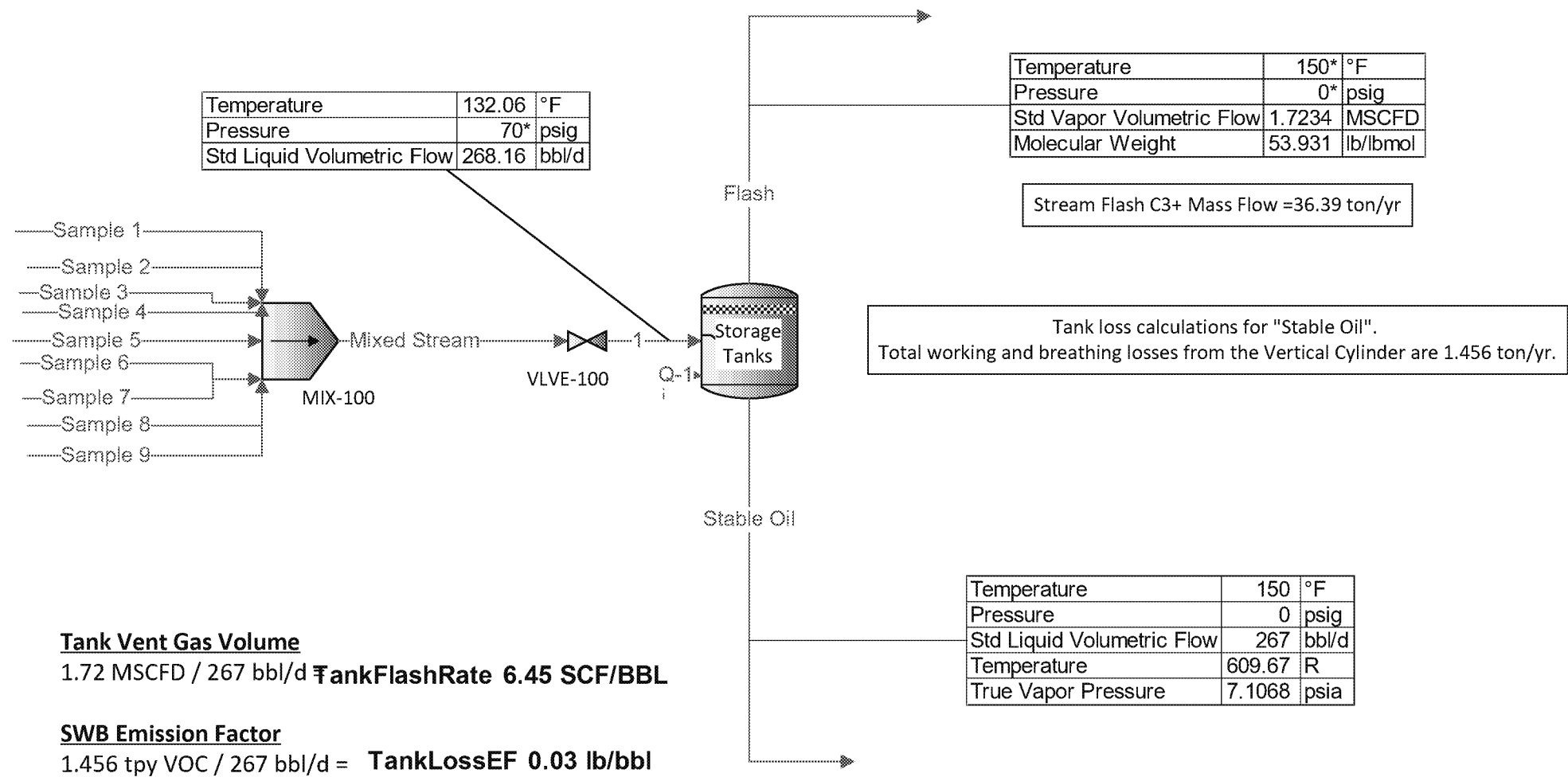
Pollutant	Emission Factor ^(a)	Estimated Emissions ^(b)		Combustor 95% Control Emissions ^(b)	
	Uncontrolled Basis	Uncontrolled	Uncontrolled	Controlled	Controlled
	(lb/bbl)	lb/hr	tpy	lb/hr	tpy
CRITERIA & GHGs					
VOCs	0.78	8.65	37.90	0.43	1.90
H2S	0.01	0.11	0.50	5.71E-03	0.03
CO2	0.01	0.13	0.58	6.58E-03	0.03
CH4	0.06	0.61	2.68	0.03	0.13
CO2e			67.70		126.17
HAPs					
Benzene	0.016	0.18	0.77	8.82E-03	0.04
Toluene	0.016	0.17	0.76	8.62E-03	0.04
ethylbenzene	3.44E-03	0.04	0.17	1.91E-03	8.38E-03
xylene	6.49E-03	0.07	0.32	3.61E-03	0.02
2,2,4-Trimethylpentane	9.51E-04	0.01	0.05	5.29E-04	2.32E-03
n-hexane	0.130	1.45	6.36	0.07	0.32
		Total HAP	8.42		0.42

Notes: (a) Emission factors based on ProMax Analyses
 Representative emissions factors were developed from multiple site analyses across the field
 Emission factor includes flashing, working and breathing losses
 H2S emissions estimated, small quantities of H2S are known to be present in the produced fluids
 (b) Estimated emissions
 $\text{lb/hr} = \text{Emission Factor lb/bbl} * \text{bbl/day} / 24 \text{ hr/d}$
 $\text{tpy} = \text{lb/hr} * 8760 \text{ hr/yr} / 2000 \text{ lb/ton}$

Promax AP-42 Emissions Report
Oil Storage Tanks

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Total Working and Breathing Losses (ton/yr)
C3	2.11E-01	1.31E-01	3.42E-01
i-C4	6.19E-02	3.85E-02	1.00E-01
n-C4	1.30E-01	8.10E-02	2.11E-01
i-C5	3.93E-02	2.44E-02	6.37E-02
n-C5	3.44E-02	2.14E-02	5.58E-02
Cyclopentane	1.60E-02	9.93E-03	2.59E-02
Cyclohexane	1.08E-01	6.74E-02	1.76E-01
C7	7.85E-02	4.88E-02	1.27E-01
Methylcyclohexane	2.37E-02	1.47E-02	3.84E-02
C8	2.63E-02	1.63E-02	4.26E-02
C9	8.10E-03	5.03E-03	1.31E-02
C10	5.54E-03	3.45E-03	8.99E-03
Benzene	1.09E-02	6.80E-03	1.77E-02
Toluene	8.21E-03	5.10E-03	1.33E-02
Ethylbenzene	1.53E-03	9.51E-04	2.48E-03
o-Xylene	2.51E-03	1.56E-03	4.07E-03
n-C6	1.28E-01	7.96E-02	2.08E-01
2,2,4-Trimethylheptane	4.71E-04	2.93E-04	7.64E-04
Acetone	2.03E-03	1.26E-03	3.29E-03
Ethanol	3.22E-04	2.00E-04	5.23E-04
n-Propanol	1.21E-05	7.51E-06	1.96E-05
Isopropanol	6.41E-04	3.99E-04	1.04E-03
tert-Butyl Alcohol	0.00E+00	0.00E+00	0.00E+00

Tribal Registration Supporting Documentation
Crude Oil Tank Emission Factor Detail



Tank Vent Gas Volume

1.72 MSCFD / 267 bbl/d **TankFlashRate 6.45 SCF/BBL**

SWB Emission Factor

1.456 tpy VOC / 267 bbl/d = **TankLossEF 0.03 lb/bbl**

Flash Emission Factor

36.39 tpy VOC / 267 bbl/d = **FlashEF 0.75 lb/bbl**

Molecular weight of the gas in equilibrium with the Stable Oil is **53.9 lb/lb-mol**

Company: Berry Petroleum Company, LLC
 Subject: Lake Canyon Tribal 3-36D-56
 Source: (4) Natural Gas Fired Tank Heaters

Rating (MMBtu/hr):	0.5
Fuel HHV (Btu/scf):	1,190
Hours/year:	8,760
Number of Units:	4

Emission Basis: Each oil tank is equipped with a single 0.5 MMBtu/hr external combustion burner. Detailed below are the emissions from a single unit as well as the combined emissions from all units.

Pollutant	Emission Factor ^(a)	Estimated Single Unit Emissions ^(b)		Estimated Combined Unit Emissions ^(b)	
	Uncontrolled Basis	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled
	lb/MMscf	lb/hr	tpy	lb/hr	tpy
CRITERIA					
NOx	100	0.04	0.18	0.17	0.74
CO	84	0.04	0.15	0.14	0.62
VOC	5.5	0.002	0.01	0.009	0.04
SO2	0.60	0.0003	0.001	0.0010	0.004
PM	7.60	0.003	0.01	0.013	0.06
GHGs					
CO2	120,000	50	221	202	883
CH4	2.30	0.001	0.004	0.004	0.017
CO2e			221		884
HAP					
Benzene	2.1E-03	8.8E-07	3.9E-06	3.5E-06	1.5E-05
Toluene	3.4E-03	1.4E-06	6.3E-06	5.7E-06	2.5E-05
Formaldehyde	0.075	3.2E-05	1.4E-04	1.3E-04	5.5E-04
n-hexane	1.8	7.6E-04	3.3E-03	3.0E-03	1.3E-02

Notes: (a) Emission factors from AP-42 1.4 (Small Boilers < 100 MMBtu/hr)
 (b) Estimated emissions
 $\text{lb/hr} = \text{Emission Factor lb/MMscf} * \text{Rating MMBtu/hr} / \text{HHV Btu/scf}$
 $\text{tpy} = \text{lb/hr} * 8760 \text{ hr/yr} / 2000 \text{ lb/ton}$

Company: Berry Petroleum Company, LLC

Subject: Lake Canyon Tribal 3-36D-56

Source: (2) 400-barrel Produced Water Tanks

Throughput (bbl/d):	153
Throughput (bbl/yr):	55,845
Hours/year:	8,760

Emission Basis:

Two (2) 400 barrel atmospheric tanks are used to temporarily store produced water from the separator. Flashing, working and breathing losses from the produced water are estimated using ProMax under typical site operating temperature and pressure. An oil carryover ratio of 1% has been assumed for the simulation.

Pollutant	Emission Factor ^(a)	Estimated Emissions ^(b)		Estimated Emissions ^(b)	
	Uncontrolled Basis	Uncontrolled	Uncontrolled	Controlled	Controlled
	(lb/bbl)	lb/hr	tpy	lb/hr	tpy
CRITERIA					
VOCs	0.0001	4.67E-04	0.002	2.34E-05	1.02E-04

Notes:

(a) Emission factors based on ProMax assuming 1% oil content
Emission factor includes working and breathing losses, flashing losses were equal to zero in the simulation

(b) Estimated emissions
lb/hr = Emission Factor lb/bbl * bbl/day / 24 hr/d
tpy = lb/hr * 8760 hr/yr / 2000 lb/ton

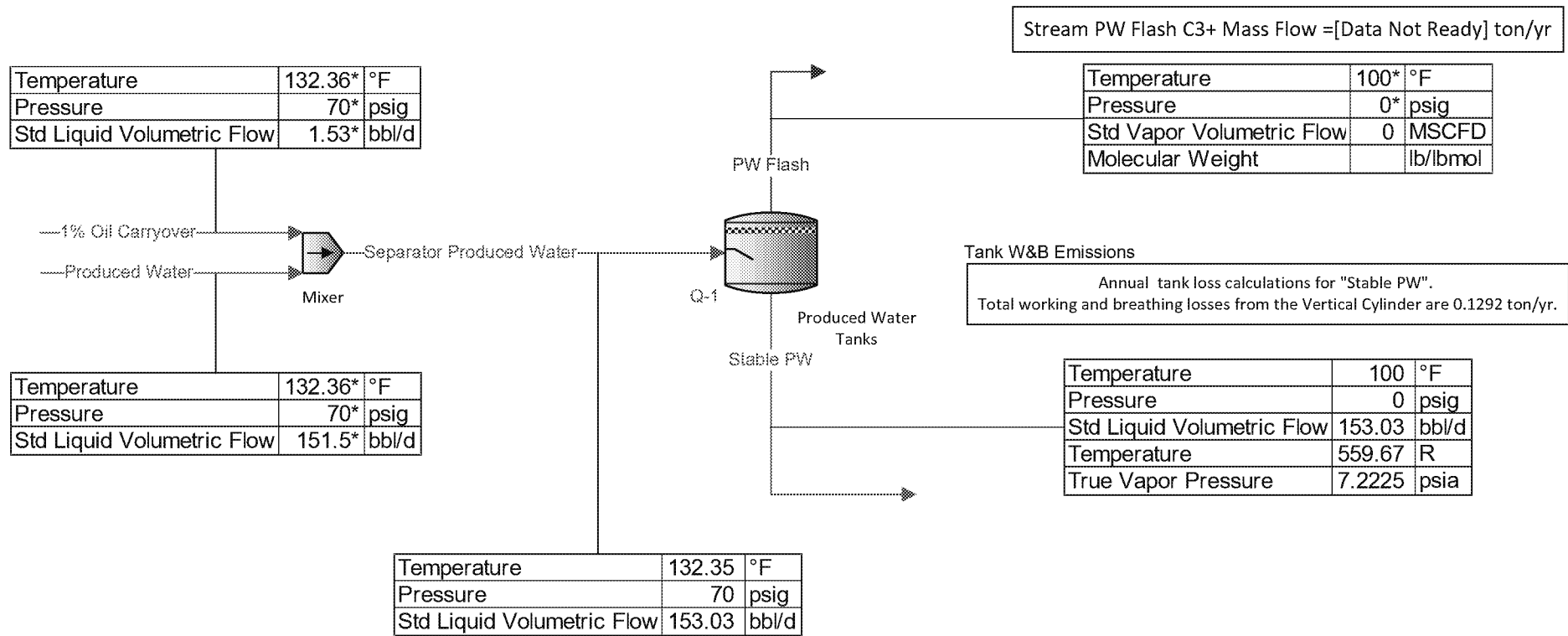
Promax AP-42 Emissions Report
Produced Water Tanks

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Total Working and Breathing Losses (ton/yr)
CO2	9.62E-05	4.19E-05	1.38E-04
N2	1.19E-04	5.17E-05	1.70E-04
C1	2.05E-04	8.91E-05	2.94E-04
C2	3.82E-04	1.66E-04	5.49E-04
C3	3.07E-04	1.34E-04	4.41E-04
i-C4	8.79E-05	3.83E-05	1.26E-04
n-C4	1.87E-04	8.15E-05	2.69E-04
i-C5	5.84E-05	2.54E-05	8.38E-05
n-C5	5.24E-05	2.28E-05	7.52E-05
Cyclopentane	2.47E-05	1.08E-05	3.54E-05
Cyclohexane	1.78E-04	7.76E-05	2.56E-04
C7	1.41E-04	6.12E-05	2.02E-04
Methylcyclohexane	4.47E-05	1.95E-05	6.42E-05
C8	5.12E-05	2.23E-05	7.35E-05
C9	1.75E-05	7.64E-06	2.52E-05
C10	1.30E-05	5.64E-06	1.86E-05
Benzene	1.83E-05	7.95E-06	2.62E-05
Toluene	1.50E-05	6.55E-06	2.16E-05
Ethylbenzene	3.24E-06	1.41E-06	4.65E-06
o-Xylene	5.03E-06	2.19E-06	7.22E-06
n-C6	2.16E-04	9.40E-05	3.10E-04
2,2,4-Trimethylheptane	8.44E-07	3.67E-07	1.21E-06
Acetone	3.32E-06	1.44E-06	4.76E-06
Ethanol	6.31E-07	2.75E-07	9.06E-07
n-Propanol	2.45E-08	1.07E-08	3.52E-08
Isopropanol	1.35E-06	5.89E-07	1.94E-06
tert-Butyl Alcohol	0	0	0
Water	0.08775	0.0382	1.26E-01

Total VOC Emissions, tpy

0.0020

Tribal Registration Supporting Documentation
Water Tank Emission Factor Detail



SWB Emission Factor

$0.002 \text{ tpy VOC} / 153 \text{ bbl/d} = 0.0001 \text{ lb VOC/bbl}$

Note: Working and breathing losses noted in the callout above include non-VOC components (e.g. water, methane, CO2, etc). The value used in the calculation of the emission factor above only accounts for VOC components.

Company: Berry Petroleum Company, LLC
 Subject: Lake Canyon Tribal 3-36D-56
 Source: (2) Natural Gas Fired Separator Heaters

Rating (MMBtu/hr):	1.0
Fuel HHV (Btu/scf):	1,190
Hours/year:	8,760
Number of Units:	2

Emission Basis: The bulk and test separators are heated by 1.0 MMBtu/hr external, natural gas-fired burners.

Pollutant	Emission Factor ^(a)	Estimated Unit Emissions ^(b)	
	Uncontrolled Basis	Uncontrolled	Uncontrolled
	lb/MMscf	lb/hr	tpy
CRITERIA			
NOx	100	0.17	0.74
CO	84	0.14	0.62
VOC	5.5	0.01	0.04
SO2	0.60	0.001	0.004
PM	7.60	0.013	0.06
GHGs			
CO2	120,000	202	883
CH4	2.30	0.004	0.017
CO2e			884
HAP			
Benzene	2.1E-03	3.5E-06	1.5E-05
Toluene	3.4E-03	5.7E-06	2.5E-05
Formaldehyde	0.075	1.3E-04	5.5E-04
n-hexane	1.8	3.0E-03	1.3E-02

Notes: (a) Emission factors from AP-42 1.4 (Small Boilers < 100 MMBtu/hr)
 (b) Estimated emissions
 $\text{lb/hr} = \text{Emission Factor lb/MMscf} * \text{Rating MMBtu/hr} / \text{HHV Btu/scf}$
 $\text{tpy} = \text{lb/hr} * 8760 \text{ hr/yr} / 2000 \text{ lb/ton}$

Company: Berry Petroleum Company, LLC
 Subject: Lake Canyon Tribal 3-36D-56
 Source: Fugitive Emissions

Hours/year:	8,760
Vapor Density (lb/scf):	0.0869

Emission Basis: Fugitive VOC emissions due to equipment leaks are estimated using equipment leak factors from 40 CFR Part 98, Subpart W, Table W-1A

Component Counts ^(a)					
Equipment	Equipment Count	Valves	Flanges	Connectors	Other
Wellheads	3	5	10	4	1
Separators	2	6	12	10	0
Heater Treater	0	8	12	20	0
Header	1	5	10	4	0

Emission Factors ^(b)	Valves	Flanges	Connector	Other
Count	32	64	36	3
Whole Gas Emission Factor (scf/component-hr)	0.121	0.003	0.017	0.193
Total Gas scf/hr	3.87	0.19	0.61	0.58

Estimated Emissions ^(c)	Mass Fraction ^(d)	scf/hr	lb/h	TPY
Total Fugitive Gas	100%	5.26		
CRITERIA and GHG				
VOC	18.6%		0.08	0.37
CO2	1.29%		5.87E-03	0.03
CH4	68.2%		0.31	1.36
CO2e			7.80	34.15
HAPs				
Benzene	0.07%		3.20E-04	1.40E-03
Toluene	0.06%		2.81E-04	1.23E-03
Ethylbenzene	0.01%		3.40E-05	1.49E-04
Xylene	0.06%		2.92E-04	1.28E-03
n-Hexane	0.67%		3.05E-03	0.01

Notes:

(a) From Subpart W for Crude Oil Production Equipment, Table W-1C

(b) Emission Factors from Subpart W, Table W-1A

Valves, Connector and Other (PRV) are gas service whole gas emission factors

Flanges is light oil service whole gas emission factor

(c) Example Emission Calculations:

Total Gas scf/hr = Σ Component Total Gas scf/hr

Total VOC lb/hr = Total Gas scf/hr * Gas Density lb/scf * Stream VOCwt%

Total VOC tpy = Total VOC lb/hr * 8760 hr/yr / 2000 lb/ton

(d) Gas Analysis: Mass fractions of each component taken from combined gas analysis

Company: Berry Petroleum Company, LLC
 Subject: Lake Canyon Tribal 3-36D-56
 Source: Combined Gas Analysis

Combined Gas
 Analysis
 Background:

A combination of four (4) gas samples were used to generate a combined gas analysis. Gas collected from across Berry's Uinta Basin field is sent to compressor stations prior to sale and is sampled at these aggregation points. The samples used here were taken from four of these aggregating compressor station inlets. ProMax was used to create an averaged field gas stream (combined stream), where the 4 samples were equally weighted and mixed.

ProMax Report Summary - Gas		
Process Streams	Combined Stream	
Component - Mole Fraction	Mass %	Mol %
Carbon Dioxide	1.2865	0.5831
Nitrogen	0.9700	0.6907
Methane	68.2454	84.8595
Ethane	10.9225	7.2460
Propane	7.9820	3.6109
Isobutane	1.5118	0.5189
n-butane	3.0937	1.0618
Isopentane	1.0618	0.2936
n-pentane	1.3754	0.3803
Cyclopentane	0.0000	0.0000
Cyclohexane	0.9922	0.2352
Heptane	0.7854	0.1564
Methylcyclohexane	0.2435	0.0495
Octane	0.6589	0.1151
Nonane	0.0000	0.0000
Decane +	0.0000	0.0000
Benzene	0.0701	0.0179
Toluene	0.0616	0.0133
Ethylbenzene	7.46E-03	1.40E-03
o-Xylene	0.0639	0.0120
n-hexane	0.6671	0.1544
2,2,4-Trimethylheptane	7.14E-04	1.00E-04

ProMax Report Summary - All Gas Samples			
Sample 1	Sample 2	Sample 3	Sample 4
Mol %	Mol %	Mol %	Mol %
1.0017	0.4402	0.4204	0.4703
0.9716	0.5302	0.6906	0.5703
86.1581	86.0708	82.7953	84.4140
6.3542	6.7097	8.1494	7.7709
2.8845	3.4766	4.2921	3.7903
0.4043	0.5248	0.6324	0.5140
0.9232	1.0279	1.2679	1.0281
0.2560	0.2779	0.3616	0.2788
0.3721	0.3407	0.4513	0.3569
0.0000	0.0000	0.0000	0.0000
0.2035	0.1930	0.2989	0.2453
0.1454	0.1199	0.1915	0.1687
0.0408	0.0375	0.0620	0.0576
0.0819	0.0942	0.1421	0.1420
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0287	0.0125	0.0160	0.0143
0.0148	9.70E-03	0.0152	0.0136
1.00E-03	1.10E-03	1.80E-03	1.70E-03
4.51E-03	4.40E-03	0.0326	6.50E-03
0.1534	0.1288	0.1790	0.1566
1.00E-04	1.00E-04	1.00E-04	1.00E-04

Company: Berry Petroleum Company, LLC
 Subject: Lake Canyon Tribal 3-36D-56
 Source: Natural Gas Pneumatic Controller Emissions

Hours/year:	8,760
Vapor Density (lb/scf):	0.0869

Emission Basis: Emissions due to the venting of motive gas through pneumatic controllers (temperature controllers, level switch controllers, regulators, etc.) are estimated using equipment leak factors from 40 CFR Part 98, Subpart W, Table W-1A. Device counts have been approximated to account for the equipment present at the facility.

Pneumatic Devices	Count	Whole Gas Emission Factor (scf/component-hr) ^(a)
Pneumatic Controllers (low-bleed)	25	1.39
Pneumatic Controllers (high-bleed)	0	37.3
Pneumatic Pumps	0	13.3

Estimated Emissions ^(b)	Mass Fraction ^(c)	scf/hr	lb/h	TPY
Total Vented Gas	100%	34.75		
CRITERIA and GHG				
VOCs	18.6%		0.56	2.46
CO2	1.3%		0.04	0.17
CH4	68.2%		2.06	9.03
CO2e			51.55	225.81
HAPs				
Benzene	0.07%		2.12E-03	9.27E-03
Toluene	0.06%		1.86E-03	8.15E-03
ethylbenzene	0.01%		2.25E-04	9.86E-04
xylene	0.06%		1.93E-03	8.45E-03
n-hexane	0.67%		0.02	0.09
2,2,4-Trimethylpentane	0.001%		2.16E-05	9.44E-05
			0.03	0.12

Notes:

(a) Emission Factors from Subpart W, Table W-1A

Onshore Natural Gas Production, Western U.S., Gas Service

(b) Example Emission Calculations:

Total Gas scf/hr = Σ Component Total Gas scf/hr

Total VOC lb/hr = Total Gas scf/hr * Gas Density lb/scf * Stream VOCwt%

Total VOC tpy = Total VOC lb/hr * 8760 hr/yr / 2000 lb/ton

(c) Gas Analysis:

Mass fractions of each component taken from combined gas analysis

Company: Berry Petroleum Company, LLC
 Subject: Lake Canyon Tribal 3-36D-56
 Source: Truck Loading Emissions

Throughput (bbl/d):	267
Throughput (bbl/yr):	97,455
Throughput (gal/yr):	4,093,110
Hours/year:	8,760

Emission Basis:

Crude oil is loaded to truck from the tank battery via submerged loading. Emissions from truck loading were estimated using Equation 1 from USEPA AP-42, Chapter 5.2-4:	
$L_L = 12.46 * SPM/T$	
Where:	
L_L is the loading losses (lb/1,000 gal),	L_L : 4.68
S is the saturation factor (dimensionless),	S : 0.6
P is the true vapor pressure of the liquid loaded (psia),	P : 7.08
M is the vapor molecular weight (lb/lbmol), and	M : 53.90
T is the absolute temperature of the liquid loaded (R).	T : 609.67

Pollutant	Emission Factor ^(a)	Estimated Emissions ^(b)	
	Uncontrolled Basis	Uncontrolled	Uncontrolled
	(lb/bbl)	lb/hr	tpy
CRITERIA			
VOCs	0.20	2.19	9.57
HAPs			
Benzene	2.39E-03	2.66E-02	1.17E-01
2,2,4-Trimethylpentane	1.35E-04	1.50E-03	6.56E-03
Toluene	2.58E-03	2.87E-02	1.26E-01
ethylbenzene	6.07E-04	6.76E-03	2.96E-02
xylene	1.08E-03	1.20E-02	5.28E-02
n-hexane	0.06	6.65E-01	2.91E+00
		Total HAP	3.24

Notes: (a) Emission factors based on AP-42 Ch5, HAP wt% of tank working losses used

(b) Estimated emissions

lb/hr = Emission Factor lb/bbl * bbl/day / 24 hr/d

tpy = lb/hr * 8760 hr/yr / 2000 lb/ton

Company: Berry Petroleum Company, LLC
 Subject: Lake Canyon Tribal 3-36D-56
 Source: Enclosed Combustor

Emission Source: Tank Vents
Source Type: Enclosed Combustor
Heat Capacity (MMBtu/hr) ^(a) : 2.0
Waste Gas HHV (Btu/scf) ^(a) : 2,765
Operating Hours per Year: 8760

Emission Basis: The enclosed combustor controls emissions from the crude oil and produced water storage tanks. Emissions from the enclosed combustor were estimated based on the expected flow rate and heat value of the tank vent stream as calculated by ProMax and AP-42 emission factors were used for combustion emissions.

Pollutant	Emission Factor ^(b)	Units	Estimated Emissions ^(c,d)	
			Hourly	Annual
			(lb/hr)	(tpy)
CRITERIA & GHG				
NOx	0.068	lb/MMBtu	0.14	0.59
CO	0.37	lb/MMBtu	0.74	3.22

Notes:

(a) Waste gas flowrate based on ProMax oil tank flash stream with a 20% factor applied (e.g. calculated heat capacity * 1.2)

Heat Capacity (MMBtu/hr) = Waste Gas Heating Value (Btu/scf) x (1 MMBtu/1,000,000 Btu) x Flash Volumetric Flow (scf/hr)

(b) Emissions factors based on AP-42 Tbl 13.5-1

(c) Emission Rate (lb/hr) (Heat Rating, MMBtu/hr)* (Emission Factor, lb/MMBtu)

Annual Emission Rate (tpy) = (Hourly Emission Rate, lb/hr) * (Hour of Operation Per Year, hr/yr) / (2,000 lbs/ton)

(d) Emission Rates are based on maximum estimated operation of the VCU, non combustion emissions are included in the source emissions (e.g. tanks)

Company: Berry Petroleum Company, LLC
Subject: Lake Canyon Tribal 3-36D-56
Source: Three (3) Pumpjack Engines

Engine Hp:	65.0
Engine BSFC (Btu/hp-hr):	13,300
Heat Input Capacity (MMBtu/hr):	1.73
Hours/year:	8760
Number of Units:	3

Emission Basis: The pumpjack engines at this facility provide mechanical power to lift liquids to the surface. The engines have been previously installed and tested in accordance with NSPS JJJJ . Emissions from these units has been estimated using NSPS JJJJ thresholds and AP-42 emission factors.

Pollutant	Emission Factors ^(a)	Unit Emissions ^(b)	
	Uncontrolled Basis	Uncontrolled	Uncontrolled
		lb/hr	tpy
CRITERIA			
NOx	4.3 g/hp-hr	1.85	8.10
CO	3.4 g/hp-hr	1.46	19.21
VOC	0.12 lb/MMBtu	0.31	4.09
SO ₂	5.9E-04 lb/MMBtu	0.0015	0.020
PM ₁₀	0.000077 lb/MMBtu	0.00020	0.0026
PM _{2.5}	0.000077 lb/MMBtu	0.00020	0.0026
GHGs			
CO ₂	110 lb/MMBtu	285.29	3749
CH ₄	1.25 lb/MMBtu	3.24	42.6
CO2e			4814
HAPs			
Benzene	4.4E-04 lb/MMBtu	0.0011	0.015
Toluene	4.1E-04 lb/MMBtu	0.0011	0.014
Ethylbenzene	4.0E-05 lb/MMBtu	0.00010	0.00135
Xylene	1.8E-04 lb/MMBtu	0.00048	0.0063
n-hexane	1.1E-03 lb/MMBtu	0.00288	0.0378
Formaldehyde	5.3E-02 lb/MMBtu	0.14	1.80
Total HAPs		0.14	1.87

Notes: (a) Emission Factors

NOx, CO based on engine performance test

All other factors based on AP-42 Tbl3.2-2

(b) Sample Calculations

$$(\text{bhp}) (\text{Btu/bhp-hr}) (\text{MM}/10^6) = \text{MMBtu/hr}; (\text{MMBtu/hr}) / (\text{Btu/scf}) (10^6/\text{MM}) = \text{scf/hr}$$

$$(\text{g/bhp-hr}) (\text{bhp}) (\text{lb}/453.59 \text{ g}) = \text{lb/hr}; (\text{lb/MMBtu}) (\text{MMBtu/hr}) = \text{lb/hr}; (\text{lb/hr}) (\text{hrs/yr}) (\text{ton}/2000 \text{ lb}) = \text{tons/yr}$$